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SNOW SURVEYS AND IRRIGATION WATER FORECASTS  
FOR MISSOURI AND ARKANSAS RIVERS

April 1, 1938

Soil Conservation Service -  
U. S. Department of Agriculture  
Washington, D. C.

The following data pertaining to snow surveys and irrigation water-supply forecasts are provided by Bureau of Agricultural Engineering of the U. S. Department of Agriculture, in cooperation with State departments, other Federal bureaus and local organizations. The snow measurements are made principally by field personnel of the following organizations: Forest Service, National Park Service, Bureau of Reclamation, U. S. Geological Survey, War Department and State Experiment Stations. This work is otherwise conducted cooperatively with the State Engineers of Wyoming and Colorado, and various municipalities, irrigation associations, power companies and others. Precipitation records are supplied by the U. S. Weather Bureau.

Precipitation during March on the watershed of the Missouri and its tributaries in western Montana was 51 percent more than normal. The accumulated average precipitation from October to March inclusive was 5 percent less than normal. In the eastern part of the State the precipitation during March was 46 percent above normal and the accumulated precipitation from October to March was 12 percent above normal. On the east slope of the Rocky Mountains, in Wyoming, the March precipitation was 1.4 inches which was 0.2 inch above normal. The seasonal precipitation, October to March inclusive, was 6.4 inches or 0.4 inch above normal. On the watershed of the South Platte in the mountain area of Colorado the precipitation during March was 2.1 inches, or 0.8 inch above normal and the October to March precipitation was 0.0 inches which was 0.1 above normal. Similar values for the Arkansas River watershed are 1.9 inches for March and 5.6 inches from October to March which are respectively 0.8 to 0.2 inch above normal.

Reservoir storage on the North Platte River watershed in Wyoming is 60 percent greater than it was on April 1, 1937. Storage in Alcova Reservoir which is being filled for the first time is not included in the comparison. Storage in the Shoshone Reservoir on the Bighorn River watershed is 12 percent less than last year and in Jackson Lake on the Snake River it is 20 percent less than last year. On the upper watershed of the South Platte River reservoir storage is 20 percent below what it was at this time last year and storage in the reservoirs on the lower river is 30 percent below last year. In the Poudre Valley there is 20 percent more water in storage than on April 1, 1937. There is a pronounced shortage of water for storage in the Arkansas Valley. The plains reservoirs are practically all empty and in the higher portion of the Arkansas River watershed storage is about 40 percent of what it was last year.

Soil moisture conditions improved materially on the Missouri and its tributaries in Montana during March. In the North Platte Valley in Wyoming the soil moisture condition is good except in the plains area. In the South Platte Valley in Colorado, near the foothills, the soil is generally in good condition from the standpoint of moisture but in the plains area the moisture is deficient. In the Upper Arkansas and tributary valleys there is ample moisture in the soil but in the plains area the moisture condition is poor.

The water content of the snow on the watersheds of the Yellowstone, Jefferson, Madison and Gallatin Rivers on April 1 was 13.6 inches as shown by the records from 24 snow courses. Comparable records are available







for April 1, 1937 for 18 of these courses and the records from them show that the water content is 15 percent greater this year than last. The average increase during March was 3.1 inches. Courses on the Missouri River between Helena and Great Falls show 20 percent less water in the snow than there was on April 1, 1937. Readings on the courses on the Yellowstone River indicate that there is 25 percent more water stored in the snow than last year. For the Jefferson, Madison and Gallatin River watersheds the water content is also greater than last year, the percentages being 32, 22 and 20 respectively. On the watersheds of the Shoshone, Bighorn, Tongue and Powder Rivers the water content as shown by 16 snow courses was 13.1 inches. For 11 of these courses the records are comparable with the April 1, 1937 readings. They show that the water content was 38 percent greater than last year at this time. On the watersheds of both the Shoshone and the Bighorn Rivers the water content was a little over 35 percent greater than last year. Comparable records are not available for the Tongue and Powder Rivers.

On the watershed of the North Platte proper the water content of the snow on April 1 was 20.8 inches as shown by 11 courses. Compared with last year this is 8 percent greater than it was on April 1, 1937. On the 7 courses on the Laramie River, tributary of the North Platte, the water in the snow, April 1, totalled 12.5 inches which is 20 percent more than last year. Fifteen courses on the South Platte and its tributaries show a water content of 13.3 inches. Comparable records are available for 10 of these courses. They show that the water content on April 1 was 55 percent greater than it was last year. On the Cache la Poudre River, tributary of the South Platte, 7 snow courses showed a water content of 14.7 inches, which is 65 percent greater than it was on April 1, 1937 but is slightly less than it was on April 1, 1936. Nine courses on the watershed of the Arkansas River showed 10.2 inches of water as of April 1, 1938. This is 30 percent more than it was last year.

The foregoing snow course measurements indicate that flow of all the principal tributaries of the Missouri in Montana, Wyoming and Colorado will be greater than last year by from 10 to 25 percent with the exception of the Poudre which will probably be 50 percent greater. The flow of the Arkansas as indicated by the snow in the mountains will probably be about 25 percent greater than last year.







## Summary of Federal and State Cooperative Snow Surveys

Bureau of Agricultural Engineering, U. S. Dept. Agr.; Forest Service; Colo. Agri. Expt. Station  
Issued April 11, 1938, Colo. Expt. Station, Fort Collins, Colo.

No.	Main Drainage and Snow Course	Local Drainage	Location		Description	Elev.	National Forest	Apr. 1 Snow Course Measurements					
			State	Locality				Av. Snow Depth					
								1936	1937	1938	1936	1937	1938
JEFFERSON RIVER													
6	Camp Creek*	Red Rock Cr.	Idaho	6 mi. N. Spencer	21-13N-36E	6800	Targhee	27.0	39.1	51.7	6.0	10.8	16.7
7	Moose Creek*	N. Fk. Big Hole	"	3 mi. S. Gibbons P.	27-27N-21E	6200	Salmon	---	40.8	45.4	---	12.4	14.1
MADISON RIVER													
2	Aster Creek*	Firehole R.	Wyo.	Lewis Lake	44-3N11C-6W	7700	Yel. Nat. P.	87.0	65.0	80.0	40.0	23.5	29.5
8	Lewis L. Divide*	Firehole R.	Wyo.	3 mi. S. Lewis L.	44-2N11O-7W	7900	Yel. Nat. P.	116.0	92.0	101.0	55.0	33.5	40.5
15	Twenty-One Mile*	Grayling Cr.	Mont.	8 mi. S. Gallatin	1-11S-5E	7150	" "	---	51.7	64.5	---	16.3	22.2
	West Yellowstone	South Fork	Mont.	W. Yellowstone	34-13S-5E	6700	Gallatin	---	39.8	45.3	---	13.0	14.9
GALLATIN RIVER													
Mystic Lake No. 1	Bozeman Cr.	Bozeman Cr.	Mont.	12 mi. SE. Bozeman	31-3S-7E	6600	Gallatin	---	28.7	27.0	---	6.6	8.7
		Bozeman Cr.	"	12 mi. SE. Bozeman	31-3S-7E	6600	"	---	29.2	21.6	---	7.0	4.9
		Gallatin R.	"	8 mi. S. Gallatin	1-11S-5E	7150	Yel. Nat. P.	---	51.7	64.5	---	16.3	22.2
MISSOURI RIVER													
(Helena-Great Falls)													
5	Chessman Reservoir	Ten Mile	Mont.	11 mi. SW. Helena	2-8N-5W	6200	Helena	---	26.2	22.4	---	6.9	5.9
35	Tennile Cr. Lower	"	"	17 mi. SW. Helena	13-8N-6W	6250	"	---	30.0	23.4	---	7.3	5.6
36	Tennile Cr. Middle	"	"	17 mi. SW. Helena	13-8N-6W	6800	"	---	44.6	35.7	---	11.3	8.3
37	Tennile Cr. Upper	"	"	17 mi. SW. Helena	19-8N-5W	8000	"	---	48.0	42.6	---	13.3	11.4
MARIAS RIVER													
18	Marias Pass	Two Medicine	"	Summit	48-3N113.4W	5250	Glacier N.P.	---	47.2	50.9	---	16.8	18.6
YELLOWSTONE RIVER													
Blacktail Deer Cr	Camp Senia	Blk. Tail Deer	Wyo.	11 mi. SE. Gardiner	44-9N11O-6W	7500	Yel. Nat. P.	---	---	43.8	---	---	12.9
		W. Fk. Rock Cr.	Mont.	10 mi. W. Red Lodge	2-8S-18E	7870	Custer	---	---	23.0	---	---	3.9
Cooke City	Crevice Mt. No. 1	Soda Butte Cr.	"	Cooke City	25-9S-14E	7400	Absaroka	---	30.0	32.0	---	7.3	8.2
		Yellowstone R.	"	6 mi. E. Gardiner	26-9S-9E	8400	Yel. Nat. P.	---	33.8	43.0	---	8.9	11.9
Crevice Mt. No. 2	Beaver Dams	Yellowstone R.	"	7 mi. E. Gardiner	25-9S-9E	8200	"	---	33.8	44.0	---	8.8	11.9
		Blk. Tail Deer	Wyo	11 mi. SE. Gardiner	44-9N11O-6W	7200	" "	---	---	29.8	---	---	9.0
Lupine Creek	Porcupine	Lupine Cr.	"	11 mi. SE. Gardiner	44-9N11O-6W	7300	" "	---	---	37.3	---	---	10.4
		Porcupine Cr.	Mont	12 mi. NE. Wilsall	10-4N-10E	6500	Absaroka	---	---	25.0	---	---	5.6
Lodgepole		Lodgepole Cr.	Wyo.	---	---	---	---	---	---	---	---	---	11.9







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Main Drainage and No. Snow Course	Local Drainage	State	Location		Descrip- tion	Elev.	National Forest	Apr. 1 Snow Course Measurements				
			Locality					Av. Snow Depth	Av. Water Content	1936	1937	1938
SHOSHONE RIVER												
Brooks Lake No. 1*	Shoshone R.	Wyo.	Brooks Lake	25-44N-110W	9000	Washakie	86.0	66.0	87.3	30.8	21.2	28.9
Brooks Lake No. 2*	Shoshone R.	"	Brooks Lake	23-44N-110W	9200	"	70.8	48.8	70.9	15.7	16.0	22.5
Up. Hardpan Basin	Hardpan Cr.	"	27mi. SW. Cody	25-51N-106W	9500	Shoshone	---	---	44.1	---	---	8.6
Sylvan Pass	Middle Cr.	"	Sylvan Pass	12-52N-110W	7100	Yel. Nat. P.	---	---	57.1	---	---	14.9
BIGHORN RIVER												
Togwotee Pass	Wind River	"	Togwotee Pass	29-44N-110W	9600	Teton	92.0	66.0	88.7	32.3	21.6	30.9
Brooks Lake No. 1	Wind River	"	Brooks Lake	25-44N-110W	9000	Washakie	86.0	66.0	87.3	30.8	21.2	28.9
Brooks Lake No. 2	Wind River	"	Brooks Lake	23-44N-110W	9200	"	70.8	48.8	70.9	15.7	16.0	22.5
Ranger Creek	Ranger Cr.	"	14mi. E. Shell	32-53N-88W	8800	Bighorn	---	38.1	47.9	---	6.6	9.7
Roaring Fork	Roaring Fk.	"	16mi. SW. Lander	7-31N-101W	10200	Washakie	33.0	27.3	27.2	9.9	6.3	7.2
Shell Creek R.S.	Shell Creek	"	13mi. E. Shell	19-53N-88W	7700	Bighorn	---	24.5	32.5	---	4.7	8.1
Sheridan Cr. R.S.	Sheridan Cr.	"	16mi. NW. DuBois	3-42N-109W	7500	Washakie	37.3	18.4	23.3	9.6	2.8	5.5
Whorten Meadow	Roaring Fk.	"	16mi. SW. Lander	18-31N-101W	9200	"	15.4	16.4	17.3	5.8	5.0	4.0
Tensleep R.S.	Tensleep Cr.	"	15mi. NE. Tensleep	30-49N-86W	8300	Bighorn	---	30.6	39.2	---	6.1	8.9
Dunrude Dude Ranch.	Wood River	"	11mi. SW. Sunshine	21-46N-103W	8000	Shoshone	---	---	3.6	---	---	1.8
TONGUE RIVER												
Big Goose Cr. R.S.	E. Goose Cr.	"	20mi. SW. Sheridan	4-53N-86W	7700	Bighorn	---	---	11.9	---	---	3.6
POWDER RIVER												
Red Fork	Middle Fk.	"	23mi. W. Kaycee	18-43N-85W	7500	Off Forest	---	26.9	---	---	5.4	---
Sour Dough	Sour Dough Cr.	"	10mi. W. Klondike	17-49N-84W	8500	Bighorn	---	---	23.0	---	---	4.5
NO. PLATTE RIVER												
Big Creek Lake	Big Creek	Colo.	5mi. SW. Pearl	9-11N-82W	9000	Routt	---	47.0	44.3	---	11.3	11.8
Bottle Creek	Encampment Cr.	Wyo.	7mi. SW. Encampment	24-14N-85W	8200	Medicine Bow	56.4	63.0	49.1	21.6	20.7	15.7
Columbine Lodge	Grizzly Cr.	Colo.	Rbt. Ears Pass	21-5N-82W	9300	Routt	89.6	58.3	69.0	32.3	18.4	23.1
Headquarters Park	N. French Cr.	Wyo.	Cent. / Saratoga	27-16N-80W	10100	Medicine Bow	88.1	---	---	29.7	---	35.1
North French Cr.	N. French Cr.	"	"	27-16N-80W	10200	"	---	---	89.9	---	---	35.1
N. Barrett Cr. #2	N. Barrett Cr.	"	"	30-16N-80W	9400	"	61.7	63.5	73.4	22.7	18.0	26.2







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Main Drainage and No.	Local Drainage	State	Location		Elev.	National Forest	Apr. 1 Snow Course Measurements			
			Locality	Description			Av. Snow Depth 1936	Av. Snow Depth 1937	Av. Water Content 1936	Av. Water Content 1937
SHOSHONE RIVER										
	Brooks Lake No. 1*	Wyo.	Brooks Lake	25-44N-110W	9000	Washakie	In.	In.	In.	In.
19	Brooks Lake No. 2*	"	Brooks Lake	23-44N-110W	9200	"	86.0	66.0	87.3	21.2
33	Up. Hardpan Basin	"	27mi. SW. Cody	25-51N-106W	9500	Shoshone	70.8	48.8	70.9	16.0
32	Sylvan Pass	"	Sylvan Pass	12-52N-110W	7100	Yel. Nat. P.			44.1	
									57.1	
BIGHORN RIVER										
12	Togwotee Pass	"	Togwotee Pass	29-44N-110W	9600	Teton	92.0	66.0	88.7	21.6
	Brooks Lake No. 1	"	Brooks Lake	25-44N-110W	9000	Washakie	86.0	66.0	87.3	21.2
19	Brooks Lake No. 2	"	Brooks Lake	23-44N-110W	9200	"	70.8	48.8	70.9	16.0
16	Ranger Creek	"	14mi. E. Shell	32-53N-88W	8300	Bighorn		38.1	47.9	6.6
22	Roaring Fork	"	16mi. SW. Lander	7-31N-101W	10200	Washakie	33.0	27.3	27.2	9.9
15	Sheli Creek R.S.	"	13mi. E. Shell	19-53N-88W	7700	Bighorn		24.5	32.5	4.7
20	Sheridan Cr. R.S.	"	16mi. NW. DuBois	3-42N-109W	7500	Washakie	37.3	18.4	23.3	9.6
21	Whortten Meadow	"	16mi. SW. Lander	18-31N-101W	9200	"	15.4	16.4	17.3	5.8
13	Tensleep R.S.	"	15mi. NE. Tensleep	30-49N-86W	8300	Bighorn		30.6	39.2	6.1
18	Dunrude Dub Ranch.	"	11mi. SW. Sunshine	21-46N-103W	8000	Shoshone			3.6	
TONGUE RIVER										
17	Big Goose Cr. R.S.	"	20mi. SW. Sheridan	4-53N-86W	7700	Bighorn			11.9	
POWDER RIVER										
30	Red Fork	"	23mi. W. Kaycee	18-43N-85W	7500	Off Forest		26.9		5.4
31	Sour Dough	"	10mi. W. Klondike	17-49N-84W	8500	Bighorn			23.0	
NO. PLATTE RIVER										
51	Big Creek Lake	Colo.	5mi. SW. Pearl	9-11N-82W	9000	Routt		47.0	44.3	11.3
7	Bottle Creek	Wyo.	7mi. SW. Encampment	24-14N-85W	8200	Medicine Bow	56.4	63.0	49.1	20.7
8	Columbine Lodge	Colo.	Rt. Bars Pass	21-5N-82W	9300	Routt	89.6	58.3	69.0	18.4
4	Headquarters Park	Wyo.	Cent. Saratoga	27-16N-80W	10100	Medicine Bow	88.1			29.7
37	North French Cr.	"	"	27-16N-80W	10200	"			89.9	
38	N. Barrett Cr. #2	"	"	30-16N-80W	9400	"	61.7	63.5	73.4	18.0





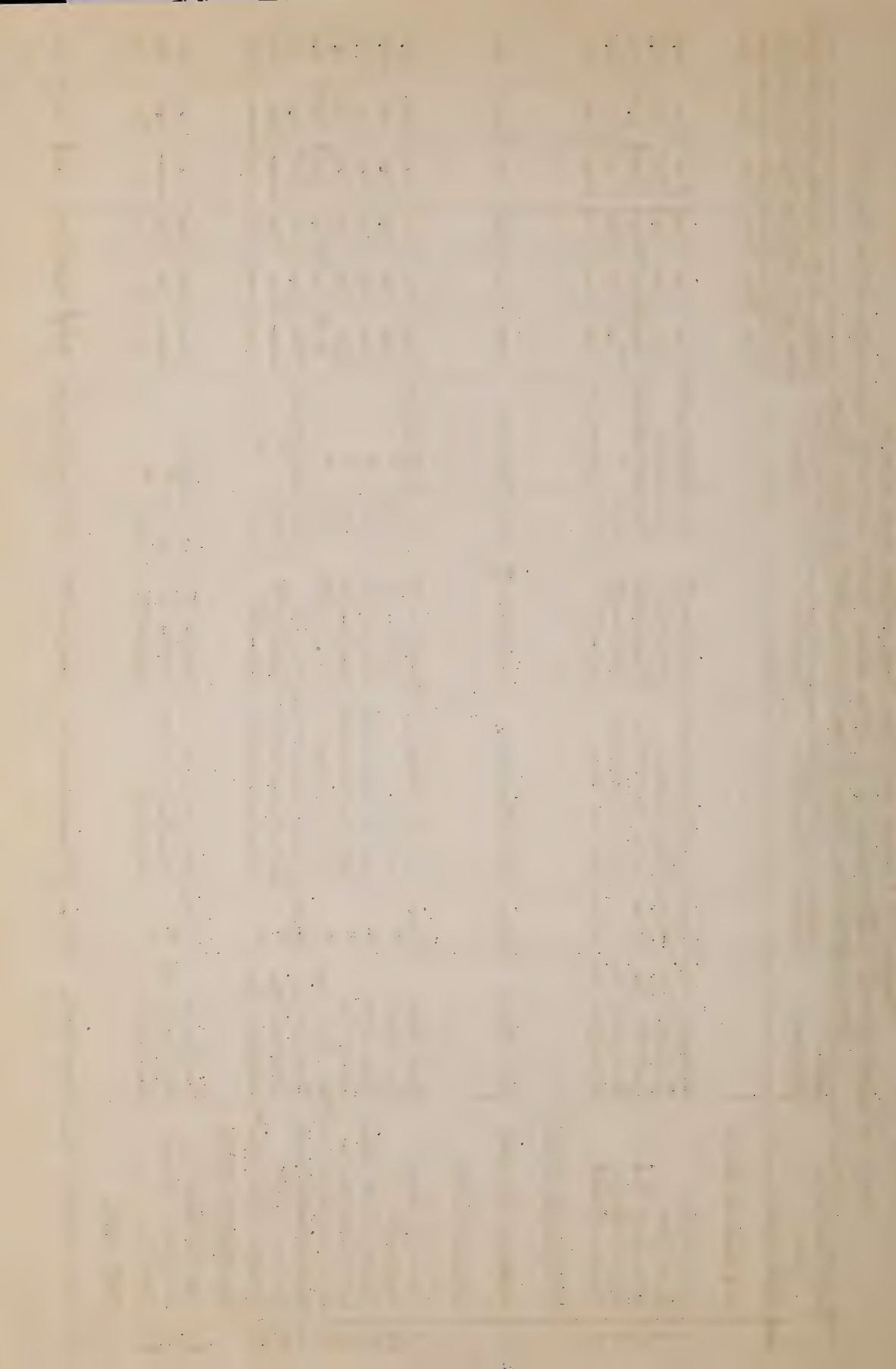


## MISSOURI AND ARKANSAS

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No.	Main Drainage and Snow Course	Local Drainage	State	Location Locality	Description	Elev.	National Forest	Apr. 1 Snow Course Measurements					
								In.	In.	In.	In.	Av. Snow Depth	Av. Water Content
								1936	1937	1938	1936	1937	1938
<b>NO. PLATTE RIVER</b>													
9	Old Battle	Encampment Cr.	Wyo.	12 mi. W. Encampment	29-14N-85W	9800	Medicine Bow	107.2	98.2	88.7	36.4	37.8	31.9
7	Park View	Illinois Cr.	Colo.	7 mi. SE. Rand	24-5N-78W	9200	Routt	47.0	27.6	43.9	13.5	9.6	13.3
39	Ryan Park No. 2	Barrett Cr.	Wyo.	Cent. Saratoga	34-16N-81W	8400	Medicine Bow	46.4	44.7	48.4	13.8	9.7	14.6
8	Weeber Spring	Encampment Cr.	"	10 mi. W. Encampment	27-14N-85W	9000	"	77.5	70.1	64.0	26.5	26.5	20.8
1	Cameron Pass*	Michigan Cr.	Colo.	Cameron Pass	2-6N-76W	10300	Roosevelt	79.6	61.1	75.9	28.7	15.3	26.7
<b>SWEETWATER RIVER</b>													
29	Grannier Meadows	Rock Creek	Wyo.	20 mi. SW. Lander	19-30N-100W	9000	Washakie	---	47.0	39.2	---	11.6	9.9
<b>LARAMIE RIVER</b>													
3	Brooklyn Lake	Nash Fork	Wyo.	7 mi. NW. Antennial	11-16N-79W	10200	Medicine Bow	89.5	64.2	68.1	31.0	19.8	23.6
11	Fox Park	Fox Creek	"	Fox Park	21-13N-78W	9200	"	46.1	30.4	39.4	14.6	7.3	11.8
36	Hairpin Turn No. 2	Nash Fork	"	5 mi. NW. Antennial	24-16N-79W	9500	"	54.0	36.3	39.2	16.0	10.7	10.5
35	Libby Lodge No. 2	Libby Cr.	"	3 mi. NW. Antennial	29-16N-78W	8700	"	37.0	29.6	23.6	10.5	7.9	6.4
34	Pole Mountain No. 2*	Soldier Cr.	"	10 mi. SE. Laramie	35-15N-72W	8700	"	8.4	6.1	26.6	3.3	2.5	8.2
4	W. Port. G-P. Tunnel	Laramie R.	Colo.	5 mi. N. Chambers L.	7-2N-75W	8600	Roosevelt	44.8	32.2	34.4	13.7	7.7	9.9
50	Deadman Hill*	Deadman Cr.	"	10 mi. W. R. Feather	26-10N-75W	10200	"	---	46.2	52.8	---	11.7	16.3
71	Deadman Hill No. 2*	Deadman Cr.	"	8 mi. SW. R. Feather	6-9N-74W	10200	"	---	---	46.6	---	---	13.1
<b>SO. PLATTE RIVER</b>													
14	Hoosier Pass	S. Platte	Colo.	Hoosier Pass	13-8S-72W	11400	Pike	58.6	30.4	48.2	19.7	7.5	13.1
57	Jefferson Creek	Jefferson Cr	"	4 mi. NW. Jefferson	23-7S-76W	10050	"	---	6.4	11.1	---	0.8	2.7
15	Fairplay	S. Platte	"	Fairplay	33-9S-77W	10000	"	0	T	7.9	0	T	1.2
<b>CROW CREEK</b>													
34	Pole Mountain No. 2	Crow Creek	Wyo.	10 mi. SE. Laramie	35-15N-72W	8700	Medicine Bow	8.4	6.1	26.6	3.3	2.5	8.2







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			Locality	Descrip- tion			Av. Snow Depth	Av. Water Content	1937	1938
							1936	1937	In.	In.
POUDRE RIVER										
3 Big South	Poudre R.	Colo.	2mi. E. Chambers L	33-8N-75W	8600	Roosevelt	13.2	7.0	3.5	2.5
1 Cameron Pass	Joe Wright Cr.	"	6mi. W. Chambers L	2-6N-76W	10300	"	79.6	61.1	28.7	26.7
2 Chambers Lake	Poudre R.	"	Chambers L	6-7N-75W	9000	"	35.4	14.9	13.8	7.6
50 Deadman Hill	N. Poudre R.	"	10mi. W. R. Feather	26-10N-75W	10200	"	---	46.2	---	11.7
71 Deadman Hill #2	N. Poudre R.	"	8mi. SW. R. Feather	6-9N-74W	10200	"	---	---	---	13.1
68 Hour Glass Lake	Little S. Poudre	"	2mi. NW. Pingree P.	18-7N-73W	9500	"	---	---	---	7.9
65 Lake Irene*	Big S. Poudre	"	1mi. SW. Milner P.	8-5N-75W	10600	Ry. Mtn. N. P.	---	---	---	28.5
BIG THOMPSON										
67 Fall River	Fall River	"	12mi. W. Estes P.	6-5N-74W	10600	Ry. Mtn. N. P.	---	---	---	22.3
65 Lake Irene*	Big Thompson R.	"	1mi. SW. Milner P.	8-5N-75W	10600	" " "	---	---	---	28.5
ST. VRAIN RIVER										
41 Wild Basin	N. St. Vrain	"	5mi. W. Allens P.	24-3N-74W	10000	Ry. Mtn. N. P.	64.4	44.2	20.7	13.7
BOULDER CREEK										
5 E. Port. Moffat T.	S. Boulder Cr.	"	East Portal	2-2S-74W	9400	Roosevelt	20.4	9.0	5.1	3.8
60 University Camp #2	N. Boulder Cr.	"	5mi. SW. Ward	28-1N-73W	10300	"	---	0#	---	19.8
CLEAR CREEK										
61 Loveland Pass #2	Clear Creek	"	10mi. W. Georgetown	27-4S-76W	10100	Pike	55.8#	41.8#	15.8#	12.1





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				Locality	Av. Snow Depth				Av. Water Content	1936		1937		1938	
										In.	In.	In.	In.	In.	In.
ARKANSAS RIVER															
73	Blue Lakes	Cuchara Cr.	Colo.	15 mi. SW. LaVeta	30-31S-69W	10000		San Isabel	---	---	---	---	---	4.4	
20	Four Mile Park	Lake Cr.	"	3 mi. SW. Twin Lakes	23-11S-81W	9700		Cochetopa	12.5	0	13.6	3.7	0	2.5	
17	Fremont Pass*	E. Fork Ark. R.	"	Fremont Pass	2-8S-79W	11300		Arapaho	40.2	44.8	62.1	22.2	12.6	17.9	
74	LaVeta Pass #2*	Cuchara Cr.	"	LaVeta Pass	22-28S-70W	9300		San Gristo Gr.	8.5*	31.5*	37.5	2.0*	9.3*	10.2	
42	Marshall Creek*	Poncha Cr.	"	Marshall Pass	24-48N-6E	10800		Cochetopa	49.3	45.1	50.8	18.0	12.8	13.8	
43	Poncha Creek	Poncha Cr.	"	Marshall Pass	19-48N-7E	10500		"	36.1	28.5	40.4	12.3	8.5	11.6	
19	Tennessee Pass	Tennessee Cr.	"	Tennessee Pass	21-8S-80W	10200		"	46.2	28.0	45.4	13.1	6.6	10.7	
21	Twin Lakes Tun.	Lake Cr.	"	9 mi. W. Twin Lakes	22-11S-82W	10500		"	50.8	33.2	43.8	12.7	6.9	11.7	
48	Whiskey Creek	Whiskey Cr.	"	Whiskey Cr. Pass				Maxwell Grant	---	---	41.1	---	9.6	8.7	

\*On adjacent drainage

#Readings on original course

φMeasurements taken on March 16.

(8326-38)



